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R&D Budget Boosts Defense, Academic Science

There is no excellent beauty that hath not some strangeness in the proportion.

—Francis Bacon

Beautiful it is not, but Mr. Reagan's spending plan for research and development does possess an extraordinary strangeness in the proportion set aside for military purposes: some 70 percent of the total that his Administration plans to spend on science, technology and related matters in fiscal 1984.

The numbers, as can be seen in the table on page 2, are huge and so is the contrast between the leapfrogging rate of growth in military R&D and the standstill—for the third straight year—in the level of support for civilian R&D activities. In fiscal 1980, the balance stood at $15.1 billion for defense R&D, and $16.6 billion for "all other." For fiscal 1984, which begins next October 1, Mr. Reagan's budget calls for $31.8 billion for defense and $14 billion for "all other."

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The accelerating shift toward military dominance of Washington's R&D spending actually got underway during the latter part of the Carter Administration. But, whatever the origins, Mr. Reagan has accelerated the pace and thereby has put even further behind a 15-year pattern of a roughly even division between the government's military and civilian R&D spending.

The Administration's rationale for giving the Pentagon a blank check for R&D, while holding down civilian spending, boils down to a compote of the Red Menace and elimination of allegedly wasteful civilian research to free up money for basic research, training, and several costly new projects. As for budgeting the National Institutes of Health for a mere $71 million above its present $3.8 billion for research and development—well, that's privately acknowledged to be in line with the ancient game of Congress generously adding to whatever the Administration budgets for NIH.

The sales argument for the distorted budget also stresses that the $6.7 billion, 29 percent increase that's proposed for Defense R&D is mainly for the development costs of the MX missile—politically expiring though it may be—and the Trident II submarine ballistic missile. Then, too, it's argued that, with industry's reported spending on R&D having passed federal expenditures, much of the burden of civilian research has shifted away from government.

With an increasingly restive Congress already hacking away at the overall Defense budget, the R&D segment is not likely to get by intact—even if the Administration can point out that the National Science Foundation has been budgeted for a 17-percent increase that will raise its budget by $180 million, to a record total for the agency of $1.2 billion.

The first test of Congressional reaction to the R&D design came on February 3, when George A. Keyworth II, the President's science adviser, appeared before the House Science and Technology Committee. Though visibly afflicted by what he privately said had been diagnosed as penumonia, Keyworth put on a spirited defense of the budget. The Democratic majority on the Committee appeared to be far from persuaded,

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In Brief

The White House science office has taken on the bunker mentality of the rest of the presidential establishment. Director Keyworth remains open and accessible to the press, but calls to many subordinates are usually returned by press officer Bruce Abell, who wants to know what you want to talk to the staffer about. Aides say Keyworth is rapped up in substantive matters and is oblivious of his office's housekeeping affairs. The alleged heavy in the business is his number two, Ron Frankum, a political type who joined the staff last year. He's so reclusive that not even Abell calls back to ask what you want.

Soon to leave the presidential science staff is Denis Prager, the last holdover from the Carter science office. Prager, who handled NIH, agricultural, and environmental affairs, says he's been at it for five years and that it's time to move on, but he hasn't yet settled on where. Some think his decision to leave was pushed along by signs that the subjects he dealt with rank pretty low among White House interests, and that they'll rank even lower as the presidential campaign season gets closer.

The Office of Technology Assessment is nearing completion of a report on one of the most controversial issues in agricultural R&D—the federal role in post-harvest research. Prepared at the request of the House Agriculture Committee, the report was inspired by a 20-percent drop in funding over the past 15 years.

Conduct of R&D by Major Federal Agencies

(In millions of dollars)

Department or agency	Obligations			Outlays		
	1982 actual	1983 estimate	1984 estimate	1982 actual	1983 estimate	1984 estimate
Defense-Military Functions	20,576	23,179	29,882	18,201	21,847	26,844
Energy Related Activities	4,758	4,712	4,713	4,974	5,012	4,911
Health and Human Services	3,935	4,316	4,416	3,978	4,262	4,339
(National Institutes of Health)	(3,432)	(3,771)	(3,842)	(3,438)	(3,737)	(3,808)
National Aeronautics and Space Administration	3,084	2,506	2,473	3,220	2,386	2,421
National Science Foundation	975	1,060	1,240	1,014	1,002	1,137
Agriculture	798	850	849	808	839	848
Transportation	309	393	519	349	376	451
Interior	381	373	329	392	411	348
Commerce	290	312	227	285	315	249
Environmental Protection Agency	335	241	208	336	295	250
Nuclear Regulatory Commission	221	210	200	209	210	200
Veterans Administration	140	165	163	138	157	156
Agency for International Development	165	152	161	179	200	152
All other[1]	388	391	418	426	425	433
Total	36,354	38,860	45,796	34,509	37,735	42,741

[1]Includes the Departments of Education, Justice, Labor, Housing and Urban Development and Treasury, the Tennessee Valley Authority, the Smithsonian Institution, the Corps of Engineers, and the Federal Emergency Management Agency.

Budget Draws Democratic Congressional Fire

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however, and was more or less in harmony with the skepticism voiced by Rep. George E. Brown Jr., (D-Calif.), an increasingly influential voice on R&D matters.

In a prepared statement, Brown said, "While I'm pleased to see some of the downward trend of the last two years reversed, as indicated in the increase in NSF's 'hard sciences' programs, most other programs in health, energy, space, social sciences, and environment are cut or remain at FY '83 levels."

Brown pointed out that, while non-military R&D reached an all-time high of $17.2 billion in 1981, it since had dropped to $14 billion. Meanwhile, he noted, "The military R&D program has increased a staggering 80 percent since 1981 and comprises a whopping 70 percent of the entire federal R&D budget...I don't want to be a spoiler," Brown continued, "but I think we have to put the Administration's proposals into perspective and take a critical look at overall trends and priorities."

Brown also criticized the budget for NIH, which, he said, has "actually lost buying power due to inflation. The total for all the institutes is up 8 percent from FY '81 figures before accounting for inflation. The Administration thinks the biological sciences will take care of themselves. Well, the scientific leaps we have taken in the last few years in biotechnology, for example, are a result of 25 years of solid commitment and steady research. I'm afraid the Administration may have lost sight of this fact," Brown declared.

In response, Keyworth insisted that NIH has enjoyed a long run of rapid growth and can hang on for a time while the physical sciences receive bigger budgets. "Today," he said, "the life sciences are very healthy, and the smaller increases won't affect their vitality."

Though the Science and Technology Committee has no jurisdiction over laws or money for NIH, the

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Q & A With Keyworth on the FY 1984 Budget

George A. Keyworth II, the President's Science Adviser, discussed the fiscal 1984 budget and other matters with SGR on February 3. Following is a transcript of that conversation, as edited by SGR for brevity and clarity.

SGR. As far as univesities are concerned, what are the policy implications of the budget?

Keyworth. First of all, we inherited a situation in which basic research was supported primarily as a source of new ideas. What we've tried to emphasize is that it's not just ideas. It's training. That once was a traditional argument for basic research; it's been very much subjugated by the idea argument, by the aspect of new technologies.

SGR. What practical difference will this make in an academic laboratory where research is conducted and, in the process, people get trained?

Keyworth. A very big difference. In most academic centers today, there's very little interest in or opportunity for interaction with industry. There's a considerable amount of peer pressure—faculty members who want to create graduate students in their own mold. They build up a chauvanism. Yet, when you look back, you see that when World War II came, scientists pitched in to build radar and nuclear weapons and so on. Today, whereas the problem is a lot less dramatic, this country, nevertheless, has a real challenge through competition. And the scientific world is going to have to do something about that. They are not prepared to. They don't have industrial connections, they have not over the last 5 to 20 years paid any attention to trying to understand what problems underlie American industry. Most of them don't have any interest. On the other hand, they receive substantial amounts of federal support. Well, they're going to have to take some interest in solutions to our problems.

SGR. Let's say you're a chairman of a chemistry department. What difference does this policy make for you? Are you supposed to go out and make friends with the local industrialists?

Keyworth. That's exactly right. All those programs in education in the budget are joint industry-government funded. Now, government may carry the bulk of the burden, but that's why they're in there. What a chairman of, let's say, a chemistry department should do, if he's not already doing it, should be to try to reach out to American industry and ask them, "What are your primary needs? Where are you being threatened? Is there any way that the expertise that I have in my department can contribute?" And, interestingly, you'll find that the companies are not going to say that such and such an outfit in Japan is manufacturing paint 25 percent cheaper. It's not going to be that kind of thing. Not from what I've heard. It's going to be worrying about problems down the road that are appropriate for academics. But, if they never ask, they'll never find out. Academic institutions have got to be responsible to protect their own freedom and creative environment. They

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Funds for New Projects

Several big new starts and expansions of existing programs are included in the Administration's R&D plans for fiscal 1984.

One of the biggest, under the auspices of the Department of Energy, calls for a $30-million start on the development of a National Advanced Materials Research Center at the Lawrence Berkeley Laboratory, in California. The final bill may run as high as $200 million. The Center, as can be seen from President Science Adviser Keyworth's ebullient remarks in his interview with SGR (page 7), is intended to be a model of Reagan-era R&D collaboration among academe,industry, and government.

Meanwhile, NSF proposes to establish a new program of Presidential Young Investigator Awards, to provide young science and engineering faculty members—defined as no more than 7 years post-PhD—with an average of $30,000 per year for up to five years for research support. A maximum of 200 awards per year is planned.

In addition, NSF will expand its current Presidential Secondary School Science and Mathematics Teaching Improvement Program, which supports workshops and training activities for teachers in grades 6-12.

There's new money for scientific equipment, too, in the NSF budget, with funds scheduled to rise from the present $112 million to $180 million next year.

BUDGET

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members responded skeptically to this taking-turns approach to federal support of science; it may be assumed they will convey their thoughts to colleagues who are positioned to deal with the matter.

It also seems likely that defense will be forced to yield a significant chunk of its R&D money—mainly in the "D" category; that the NIH budget will repeat its Lazarus act, and that NSF—abetted by the growing political faith in high-tech solutions to economic woes—will receive all that's requested, and maybe even more.—DSG

...Important to Train for Industrial Needs

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have to be very wary of sole property rights, and so on. That's their judgment, but they have to reach out.

SGR. Is there any place that's doing it well at present?

Keyworth. Yes, the model is a small school in upper New York State—Rensselaer Polytechnic Institute (in Troy). And it's George Low, who used to be with NASA, who is a superb college president, and he's been doing this effectively. Of course, Stanford and MIT have always been very effective at this. There are lots of other places. It's happening. I'm not projecting this as a brand new idea. I'm saying it's being incorporated into the priority making of our budgetary allocations, and I think the industrial sector and many academic leaders have jumped into this faster than the government has. The government really isn't used to asking itself the question "If I put a million dollars here, what's it going to do for the country?"

SGR. A lot of this sounds like the cooperative automotive research program that Frank Press [presidential science adviser under Carter] tried to start and that the Reagan Administration discarded.

Keyworth. That program was an extreme case of the federal government trying to bail out an industry that hadn't had enough management or vision to prepare itself for challenges. What we are talking about is primarily trying to meet the relative longterm needs that industry is not going to address on its own—most important of all, the training of people who can respond to this new challenge from Japan and Western Europe.

SGR. Then, the main motivation in the budget is training.

Keyworth. Right. It's talent and people. That's the number one priority. We think it's important to train those people in an environment where they see industry. And not in an environment where they think industry comes with that horrible profit motive that taints the creative environment.

Traditional Basic Research

SGR. But what does this mean for the traditional role of basic research in the universities? Science for the sake of science, let's say. Will this be able to go on as before?

Keyworth. Absolutely. I don't think the kind of research that is pursued in an academic laboratory will be very different. The creativity will still be number one—the most protected commodity. I think freedom will not be altered. On the other hand, I think an awareness of national problems will be enhanced. I had a close friend years ago, a very accomplished physicist, who couldn't tell me who the Vice President of the United States was. Now, I think it was nice living out in the mountains of New Mexico, where we didn't have to be obsessed with the complexities of American politics. But a little awareness of the citizen's responsibilities in a democratic society ought to be there. And today we are really stressed by the fact that all these countries that suffered so terribly during the Second War have rebuilt their industries, and now they've raised this tremendous competitive challenge to us that we just weren't prepared for.

No Growth for NIH

SGR. NIH is one of the big exceptions in a budget that is mainly generous toward science. Why's that?

Keyworth. If you go out to a biological research laboratory in this country, on the average, you'll find that they are extremely well-equipped, well-funded, well-supported. If you go into a laboratory in other areas, on the average, you'll find that it's just not the same.

SGR. The NIH people don't feel they're so well looked after. They're worried.

Keyworth. I know. There's a fine line. You don't do excellent research in an environment of starvation. There is a threat. But, if we had unlimited funds, or if we had a deficit that's half the size of this deficit, then you'd see an increase in NIH. But it's a matter of priorities. We got a massive increase—10 or 15 percent "real" growth across all the physical and engineering sciences, when we've got a 5-percent inflation rate.

SGR. Do you share NIH's concern about the increase in approved applications for which funds are not available?

Keyworth. Of all the arguments I hear, that's the tiredest of them all. People come to me all the time and say, "My God, we're funding only 25 percent. Just think, if we only could fund the other 75 percent, we'd get four times as much research." It's a crock. The first 10 percent is, on the average, where you get your best. Thirty-five percent is a level that's substantial. It's bigger than most agencies support. The fact that the rest look good is because the biological sciences are incredibly exciting. NIH's budget of four billion dollars is a heck of a lot of money.

SGR. NIH has just signed on with the [National Academy of Sciences] Institute of Medicine for a study of NIH organization and functions. Do you have confidence that that will be a definitive examination on which you can rely for guidance?

Keyworth. I have little confidence about any study ever being definitive. Getting a really comprehensive and objective study is a difficult thing to do. Off hand, I'm not disturbed that they picked the Institute of Medicine. The NIH is a class act. It is a good organiza-

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Academy President Reacts Favorably to '84 Budget

The Administration's science budget for fiscal 1984 has drawn a generally favorable response from an early critic of Reagan science policy, Frank Press, President of the National Academy of Sciences, who served as presidential science adviser under Jimmy Carter.

As relayed through an Academy spokesman who said Press didn't want to be pestered by reporters' inquiries (very wise of him), Press described the budget as "very innovative," particularly in regard to the new program of support for young researchers and expanded aid for pre-college science training.

Press was reported to have praised the Administration for redeploying development funds to basic research. "In that vein," said the Academy relayman, "he found highly laudable the increases in funds available for physical sciences and mathematics and the basic energy sciences."

Press was also said to be "happy" about "the beginning of the restoration of support for the social sciences"—which, having been reprieved from extinction, have been granted a pittance.

Finally, it was reported that the Academy President's "Chief concern was that there was only a 2 percent increase in support of biomedical research at a time of great productivity and deep discovery in both basic and clinical sectors."

...National Labs: "They've Got to Change"

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tion. There's no question about that. No one is talking about putting the screws on NIH. But there comes a time when you have to look at what you're spending your budget on. I find it very hard for NIH to make the same kind of arguments that can be made for a field like fundamental mathematics. When we first looked into mathematics, we didn't realize how much it had deteriorated from lack of support.

High-Energy Physics

SGR. You said recently that the high-energy physics community has been more concerned with institutional survival than with concentrating resources on getting science done, that that's why European high-energy research has gone ahead of us. Are you going to knock heads to deal with this problem.?

Keyworth. I have to avoid getting irrational on this subject. They're going to have a meeting at Woods Hole this summer. And I'll certainly try to do everything in my power to force a recommendation—there are many options—but right now the options are so heavily influenced by pure institutional concerns, such as the employment rate at Brookhaven National Laboratory. If the community suggests that the best thing to do is to build the Isabelle facility at Brookhaven, I think that would be wonderful. But that hasn't been the situation at all. It's been nothing except a very, very small number of scientists either at Brookhaven, or in the eastern corridor who prefer to travel to Brookhaven, that have been strongly supporting this very expensive facility that is rapidly being bypassed by time. It's a WPA project.

SGR. Do you expect major changes in the level of support for the national laboratories?

Keyworth. What we're going to see more and more—and that's in the various reviews of the labs that we've been getting—is that they've got to change. I think you'll see their overall missions change much more. You'll see them become much more directed laboratories. That doesn't mean managed. I sure don't see much justification for their growth, nor do I see much sign of growth. On the other hand, we are seeing major thrusts, for example, at the Stanford accelerator, and major emphasis at the Fermilab, and the new materials center at Lawrence Berkeley, which is really a model for how some national laboratories should do things, and we're seeing a major increase in the weapons R&D. So, there are things that are happening, but behind this, on the average, you're seeing reductions.

Agricultural Research

SGR. You were paying some attention to agricultural research last year.

Keyworth. We've taken a small step in the right direction. We've increased their competitive grants by about 50 percent; but still, it's a small fraction of the total. We're more likely to begin better and better cooperation with the centers of biotechnology, and that's a good thrust. American agricultural research is pretty good. But there needs to be some changes. They won't happen overnight, but they are happening.

SGR. Do you foresee major changes in the big centers of the Agricultural Research Service?

Keyworth. The White House Science Council took a look at a few of them, as part of its review of national labs, and told me that they found very high-class research—really advanced research—and also research that was clearly dominated by traditional concepts. I don't think there's a question of the major centers not doing good research. The real issue is getting better ac-

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...Defense Emphasis Reflects "Urgent Need"

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cess to the world of biotechnology. There's a good amount of that already; there just could be more. And, secondly, focusing more and more on areas of better use of water and better soil conservation than strictly on the tremendous benefits we've gotten from crop productivity.

SGR. Do you feel any concern about the enormous disproportion that has developed between government spending on civilian and military research? Considering the stress that you've put on our economic problems, aren't the priorities confused?

Keyworth. I've tried to focus my public comments on the science enterprise, and not to focus on defense. Restoration and maintenance of economic security is a longterm goal of this country. The most critical problem of today is the problem of talent, tomorrow's talent. We are addressing that. But defense is something else. Defense is an absolutely urgent need. It's remedial. Like it or not, and however one feels about defense, we are faced right now, for the first time, with the fact that the Soviet Union can essentially annihilate our entire ICBM fleet in a first strike.

SGR. They can't get to our submarine-based missiles.

Keyworth. I carefully qualify that. I'm referring to the landbased missiles. This does not mean that we are subject to a first strike. It means that one arm is.

Civilian R&D to Grow Again

SGR. The submarine arm is very survivable, we are told.

Keyworth. It is today. I feel totally confident that it will be for the rest of this century. But how long does it take to restore a lost military capability? It takes a substantial amount of time. That's why massive R&D on the MX and the Trident 2 are absolutely critical. The balance in R&D doesn't bother me. What bothers me is whether we're good enough in these areas. And I do think that in the course of time, we'll see civil R&D grow again. But it will be after we remove funding from the areas where the benefit has been so close to zero that it's hard for me to distinguish the difference.

SGR. Your concern about training seems to reflect a fear that a shortage of high-quality scientists and engineers is impending. But right now a lot of people with good degrees are having trouble finding suitable employment.

Keyworth. That's true, in some cases. But, in general, there's a shortage already for skilled engineers and scientists in areas of peak demand. But, more important, the industrial leaders say this is their area of top concern— where are they going to get tomorrow's people. We've been at the depths of a period of low economic growth. Any projection shows a rapidly accelerating need in these areas.

Science and Secrecy

SGR. You've got a study underway in response to the Academy report on Scientific Communication and National Security *(SGR Vol. XII, No. 17). Where does that seem to be headed?*

Keyworth. We haven't concluded it yet, of course. But I can certainly tell you where I stand. We have three major areas of technology transfer to the Soviet Union, our potential adversary: First, through intelligence activities; secondly, it goes directly from American industries, particularly our overseas subsidiaries, and, thirdly—a very distant third—from our academic research centers. I think we'll inevitably conclude that the leakage from academic centers is very small. And where it exists, it's very localized. An example is very-high-speed integrated circuits, funded by DoD. In the specific area of process development, of developing the tools for manufacturing, there may be a need to constrain some transfers of knowledge. But I don't think you're going to see academia affected in any substantial way by the results of this or any other review. It's just not a major area of leakage.

SGR. Then, you're essentially in harmony with the Academy report.

Keyworth. Not in every element. The report was a responsible, good piece of work, and I might take exception with a few small corners of it, but basically, I liked it.

SGR. Why are you pointing so much attention to the

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Defense's Growing Share of R&D

	(Millions of Dollars)			Percent Change		
	FY 82	FY 83	FY 84	83/82	84/83	84/82
Total Federal R&D	37,587	40,109	46,991	6.7	17.2	25.0
Total Defense R&D	20,866	23,502	30,320	12.6	29.0	45.3
Total Non-Defense R&D	16,721	16,607	16,671	-0.7	0.4	-0.3

Source: The Budget of the United States Government 1984

...Sees Model in Berkeley Materials Lab

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new materials center at the Lawrence Berkeley lab. NSF has been supporting over a dozen materials labs for years. What's different about this venture?

Keyworth. We've been trying for years to bring the national laboratories to bear more and more on national needs, and we've observed that words alone are not enough. It's wonderful to say you need better mission statements, and so on, but what you need also are models. Lawrence is the only national laboratory that sits on a major academic campus. Furthermore, materials is an area of science where they're very good, and where the nation's expertise is certainly paramount. And you've got a discipline where a tremendous number of industries need to draw upon research advances in condensed matter and material sciences. So, you've got a natural. And we're going to try to create a model environment in which academia, the federal research laboratories, and industrial people can cooperate.

SGR. Is it to be emulated in another subject area?

Keyworth. I don't know, but providing stimuli and policy guidance to the national laboratories has not received a very imaginative response, to say the least. In fact, the entire scientific community has not been characterized by imaginative responses to this new economic competition. We're trying to encourage this by holding up a model. I can't say where it will occur next, but I hope this will be a further clarification of our priorities.

New Funds for Lab

SGR. Why is a lab of that scale needed?

Keyworth. You've got this enormous resource—just in the DOE labs of over 50,000 people—that you'd also like to bring to bear to the economic problems. NSF's materials labs have been a good activity, but almost entirely in the academic area. We're trying to broaden it into the national laboratories.

SGR. Will it be different in substance from what goes on at the other materials labs.

Keyworth. Oh, yes, the synchrotron light capability will very much be an augmentation of what exists at Brookhaven, not an overlap. One of the areas we're looking at is in theoretical chemistry, where there really is no forefront theoretical chemistry capability on a largescale computer. Members of the materials science community who have been going along in their own way in the past may, first of all, fear this as a new thrust that—as has happened in high-energy physics—may not have the funds to back it up. But we're trying to assure them that there are new operating funds to go along with this new capital investment.

SGR. Are they afraid it's going to come out of their hides?

Keyworth. Yes, they are. And secondly, they're concerned because it wasn't on their communally established list of priorities. For one thing, it's too big. No one was thinking about initiatives of this size.

SGR. Were they consulted?

Keyworth. A lot of different members were, but I'm not so sure that the traditional communities were part of the overall process.

SGR. After cuts and policy shifts at the many of national labs, do you feel they're now in line with what the Administration wants?

Keyworth. If you take a hard look at the national laboratories today, you'll still see that a very substantial amount of work, a good fraction of their work, has very little impact on industrial competitiveness, very little impact on training of people, and very little impact on defense. So, naturally, you ask yourself, "What does it have impact on?" The answer is not absolutely clear to me. I'm not being facetious. There's an awful lot of potential, talent, and resources there. And I think the pertinence of work could be enhanced greatly. There's still some room for substantial directions there. We've made the policies quite clear, but we still have a lot of work to do.

Shuttle Faces Underutilization

SGR. You've said that only about 30 percent of the Space Shuttle capacity has been booked for flights, and that that's a good reason for not building a fifth shuttle. Does that allow for the Defense Department's plans.

Keyworth. Absolutely, that's the major part of it. Now, that sounds like there's more slop than there really is, because you need a substantial degree of insurance, and you only have four shuttles. But, looked at from virtually every angle, it looks as though we do not have a problem; we have much more of a problem in shifting the overall space program around into using the shuttle.

SGR. Could we get by with fewer than four?

Keyworth. I said we have insurance in the program with four. If nothing happens to any shuttle for many years to come, then we could get by with three. The use-projection curves come from an early era and are not justified by today's facts.

SGR. Last year, when there was pressure for the Administration to do something about science education, the response was that you wanted to wait for completion of a study underway by a Commission of the National Science Board. But their final report is still some months off and you're plunging in with several new pro-

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...Sees No Change Soon in Soviet R&D Ties

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grams.

Keyworth. I speak for myself. I didn't have any idea how long it was going to take them to say anything.

SGR. They said it would be an 18-month study, with an interim report along the way.

Keyworth. I first went over and talked to the National Science Board in the summer of '81, and asked for some help from the Board in the formulation of the budget that was under review at that time. Instead, many, many months later, we got the announcement of the Commission. If you take a snapshot from last summer, when we were working up this [the fiscal 1984] budget, and compare it to a snapshot of the year before, there have been a lot of changes in the country. The President has discussed this quite openly. The results of [economic] competition have been greater than was predicted. The need is an urgent need, and I don't think we could wait. If we waited for the Commission, I don't think we could have got anything going during President Reagan's first term. The Commission's recommendations will be valuable for the next steps.

SGR. Have you had any personal contacts with Soviet officials since you became science adviser?

Keyworth. [Humorously] The Soviet science attache has not, to my recollection, visited me in my office.

SGR. In what areas of science and technology could we usefully collaborate with the Soviets? Not just for purposes of political harmony, but for getting some useful work done.

Keyworth. The Soviets are pretty good in fusion technology, for example. They've got some good high-energy physicists. I don't know of any areas where we need Soviet expertise particularly. To me it's a question of four billion people in the world, and 225 million of them are in the United States, and we're all about equally equipped, and there's expertise everyplace. We might be interested to see how the Soviets weld thick sections of titanium. They have had a program of applying that technology to deep submarine capabilities.

SGR. Do you see any research areas in which there could be fruitful collaboration with the Soviets?

Keyworth. If we had more trusting relationships, in general, we could have fruitful interactions in a majority of areas of science. There are very few areas where the Soviets are ahead of us, where we could improve our performance by an interaction. The major improvement would come from broadening the number of people with whom you're discussing intellectually challenging issues.

SGR. Is any change in sight in research collaborations with the Soviets?

Keyworth. I certainly don't see change occurring soon. But the Soviet Union has a new leader, and as, hopefully, we see more and more dialog with the Soviet Union, we may see a thawing in our relations. It depends very heavily on what happens in the arms-reduction negotiations.

NIH Names Aging Inst. Head

T. Franklin Williams, co-Director of the Center on Aging at the University of Rochester Medical Center, has been appointed Director of the National Institute on Aging, of the National Institutes of Health. The appointment is effective July 1.

Four Elected to NAS Council

The following have been elected to the Council of the National Academy of Sciences: Richard Garwin, IBM; Daniel Nathans, Johns Hopkins University School of Medicine; Peter H. Raven, Missouri Botanical Garden, and Herbert A. Simon, Carnegie-Mellon University. Bryce Crawford, University of Minnesota, was re-elected to a four-year term as Academy Home Secretary.

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